

Application Serial No.: 10/004,363
Amendment and Response to June 19, 2007 Non-Final Office Action

REMARKS

The present Amendment follows a Decision from a Pre-Appeal Brief Conference to reopen prosecution and to withdraw the previous rejection. Claims 1, 2, 3, 5, 7 through 18, and 20 through 23 are in the application. Claims 1, 12, 13 and 17 are the independent claims herein. Reconsideration and further examination are respectfully requested.

Double Patenting Rejections

Claims 1 through 3, 5 through 18 and 20 through 29 were rejected for obviousness-type double patenting over the claims of U.S. Patent No. 6,535,574 and over the claims of U.S. Patent Application Serial No. 10/051,088. Applicants currently intend to file Terminal Disclaimers to obviate the rejections once the present application is otherwise deemed to be in condition for allowance.

Objection to Specification

The specification has been amended to include the patent number and issue date of the listed reference. Withdrawal of the objection to the specification is respectfully requested.

Subject Matter Rejection

Claims 1-3, 8 and 9 were rejected under 35 U.S.C. §101 as allegedly reciting non-statutory subject matter. This rejection is respectfully traversed.

In particular, the rejection alleges that the recited subject matters "do not result in any kind of physical transformation, nor does it provide a useful, tangible and concrete result". Applicants disagree with this allegation. Nevertheless, Applicants note that Section IV.B. of the Interim Guidelines indicates that any physical transformation or useful, tangible and concrete result is to be evaluated only after establishing a prima facie case that the claims do not fall into an "enumerated statutory category": process, machine, manufacture, or composition of matter. No such prima facie case has been established in the present instance.

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Stated differently, the allegation in the Office Action is only relevant if the claims are directed to one of the §101 judicial exceptions: "an abstract idea, a law of nature, or a natural phenomenon." Since Claims 1-3, 8 and 9 clearly describe a process that cannot reasonably be considered an abstract idea, a law of nature, or a natural phenomenon Applicants submit that Claims 1-3, 8 and 9 constitute statutory subject matter. Withdrawal of the rejection under §101 is respectfully requested.

Prior Art Rejections

Claims 1 through 3, 5, 7, 9-14, 16-18 and 20-23 were rejected under 35 U.S.C. §102 as allegedly anticipated by U.S. Patent No. 6,405,072 to Cosman, and Claim 8 was rejected under §103 in view of Cosman. Reconsideration and withdrawal of the rejections are respectfully requested.

Claims 1 and 17

Independent Claim 1 relates to acquisition of first three-dimensional surface data representing at least a portion of a patient's body while the patient is in a first position substantially maintained during a computed tomography scan, acquisition of second data independent from the first data and representing at least one internal three-dimensional portion of the patient's body while the patient is in the first position, determination of a location of an isocenter of the patient based on the second data, and conversion of the first three-dimensional surface data to a coordinate frame of the patient based on the location of the isocenter. Claim 1 further concerns acquisition of third three-dimensional surface data representing at least the portion of the patient's body while the patient is in a second position substantially maintained in preparation for radiation treatment to be delivered by a radiation treatment station, conversion of the third three-dimensional surface data to a coordinate frame of the radiation treatment station, and determination of if the first position corresponds to the second position by directly comparing the converted first three-dimensional surface data to the converted third three-dimensional surface data.

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As previously described, some embodiments of the foregoing features may provide efficient determination of whether a patient's position at a radiation treatment station corresponds to a position that was maintained during a computed tomography scan.

The newly-cited portions of Cosman and new arguments are not believed to remedy the deficiencies in the prior Office Actions. Specifically, Cosman plainly lacks any description of acquisition of third three-dimensional surface data representing at least a portion of a patient's body while the patient is in a second position substantially maintained in preparation for radiation treatment to be delivered by a radiation treatment station, conversion of the third three-dimensional surface data to a coordinate frame of the radiation treatment station, and determination of if the first position corresponds to the second position by directly comparing the converted first three-dimensional surface data to the converted third three-dimensional surface data. Applicants note that the Office Action fails to cite any portions of Cosman that allegedly disclose conversion of the third three-dimensional surface data to a coordinate frame of the radiation treatment station.

Applicants acknowledge that Cosman describes acquiring image scan data (i.e., three dimensional internal data) that associates a target with reference points on the surface of a patient. In contrast to Claim 1, however, Col. 6, lines 39 through 59 describes a procedure for then determining a three-dimensional position of a LINAC isocenter in the coordinate space of a camera system C located in the same room as the LINAC. Col. 10, lines 37 through 57 also describe acquiring surface data (i.e., reference data) which from which positions of treatment plan targets can be established "relative to the coordinate space of the camera system". Col. 15, line 8 through col. 16, line 42 similarly describes a procedure to determine a location of a target within a patient's body with respect to a LINAC used to treat the target. According to the described procedure, block 35 provides image scan data that associates the target with reference points on the surface of the patient. Next, in a LINAC treatment room, cameras 140 determine positions of index markers 20, 21 and 23 marking the reference points and a position of the LINAC in camera space. The positions are then correlated to the image scan data (which provides a location of the target with respect to the reference points) in order to determine the location of the target with respect to the LINAC.

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Col. 6, lines 12-39 provides a description of the above-mentioned correlation between camera-space data acquired in a treatment room and image scan/imaging data acquired in a CT room. As described therein, locations of markers 20, 21, 23, 24, 30, 31, 32, 40A, 40B and 40C are determined in camera space in a treatment room. Next, "the index marker locations are compared to marker positions determined from imaging data to accomplish a "best fit" as well known. Accordingly, the image data defining the patient is transformed to camera space" (emphasis added). Since the transformed image data includes a target location, the target location in camera space can be evaluated with respect to a position of a LINAC isocenter in camera space. Cosman therefore relies entirely on camera space-based correlations.

Accordingly, Applicants respectfully submit that Cosman does not disclose or suggest conversion of third three-dimensional surface data to a coordinate frame of a radiation treatment station. Cosman is therefore unable to directly compare the claimed converted first three-dimensional surface data to the claimed converted third three-dimensional surface data.

Claim 1 is therefore believed to be in condition for allowance. Claim 17 relates to a medium storing controller-executable process steps that roughly correspond to the method of Claim 1. Claim 17 is therefore also believed to be allowable for at least those reasons presented above with respect to Claim 1. Withdrawal of the rejections of Claims 1, 17 and their respective dependent claims is therefore respectfully requested.

Claim 12

Independent Claim 12 relates to a method including acquisition of computed tomography data of a patient while the patient remains substantially in a first position, acquisition of first three-dimensional surface data of the patient independent from the computed tomography data while the patient remains substantially in the first position, determination of a radiation treatment plan based on the computed tomography data, the three-dimensional data, and data representing a physical layout of a radiation treatment station, determination of a location of an isocenter of the patient based on the computed tomography data, and conversion of the first three-dimensional surface data to a coordinate frame of the patient based on the location of the isocenter. The method further includes acquisition of second three-dimensional surface data of the patient while the patient remains substantially in a second position at the radiation treatment

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station, conversion of the second three-dimensional surface data to a coordinate frame of the radiation treatment station, determination of whether the first position corresponds to the second position by directly comparing the converted first three-dimensional surface data to the converted second three-dimensional surface data, and delivery of radiation to the patient according to the radiation treatment plan if it is determined that the first position corresponds to the second position.

Consequently, Cosman is not seen to disclose or suggest at least conversion of first three-dimensional surface data of a patient in a first position to a coordinate frame of the patient based on an isocenter location, conversion of second three-dimensional surface data of the patient in a second position at a radiation treatment station to a coordinate frame of the radiation treatment station, and determination of whether the first position corresponds to the second position by directly comparing the converted first three-dimensional surface data to the converted second three-dimensional surface data.

In particular, and as described in detail above, Cosman describes acquiring camera data including positions of surface markers in camera space and transforming previously-acquired image scan data of surface markers and a target to the camera space based on positions of the surface markers in the camera data and the image scan data. The transformed image scan data can be used to evaluate the target location in camera space with respect to a position of a LINAC isocenter in camera space. Nowhere does Cosman disclose or suggest conversion of second three-dimensional surface data of a patient in a second position at a radiation treatment station to a coordinate frame of the radiation treatment station.

Claim 12 is therefore believed to be in condition for allowance and withdrawal of the rejection thereof is respectfully requested.

Claim 13

Independent Claim 13 concerns a system which includes a computed tomography scanning device for acquiring computed tomography data of a patient while the patient is in a scanning position, a first surface photogrammetry device for acquiring first three-dimensional surface data independent from the computed tomography data of at least a portion of the patient's body while the patient is in the scanning position, and an operator station for

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determining a location of an isocenter of the patient based on the computed tomography data, and for converting the first three-dimensional surface data to a coordinate frame of the patient based on the location of the isocenter. The claimed system also includes a radiation treatment station for delivering radiation to the patient, a second surface photogrammetry device for acquiring second three-dimensional surface data of at least the portion of the patient's body while the patient is in a treatment position on the radiation treatment station, and a controller for converting the second three-dimensional surface data to a coordinate frame of the radiation treatment station, and for determining if the treatment position corresponds to the scanning position by directly comparing the converted first three-dimensional surface data to the converted second three-dimensional surface data.

Cosman, as described above, does not disclose or suggest conversion of second three-dimensional surface data of a patient in a second position at a radiation treatment station to a coordinate frame of a radiation treatment station, and determination of whether a first position corresponds to the second position by directly comparing converted first three-dimensional surface data to the converted second three-dimensional surface data.

Claim 13 is therefore believed to be in condition for allowance, and withdrawal of the rejection thereof is respectfully requested.

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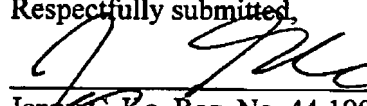
The outstanding Office Action presents a number of characterizations regarding each of the applied references, some of which are not directly addressed herein because they are not related to the rejections of the independent claims. Applicants do not necessarily agree with the characterizations and reserves the right to further discuss those characterizations.

For at least the reasons given above, it is submitted that the entire application is in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience. Alternatively, if there remains any question regarding the present application or any of the cited references, or if the Examiner has any further suggestions for expediting allowance of the present application, the Examiner is cordially requested to contact the undersigned.

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